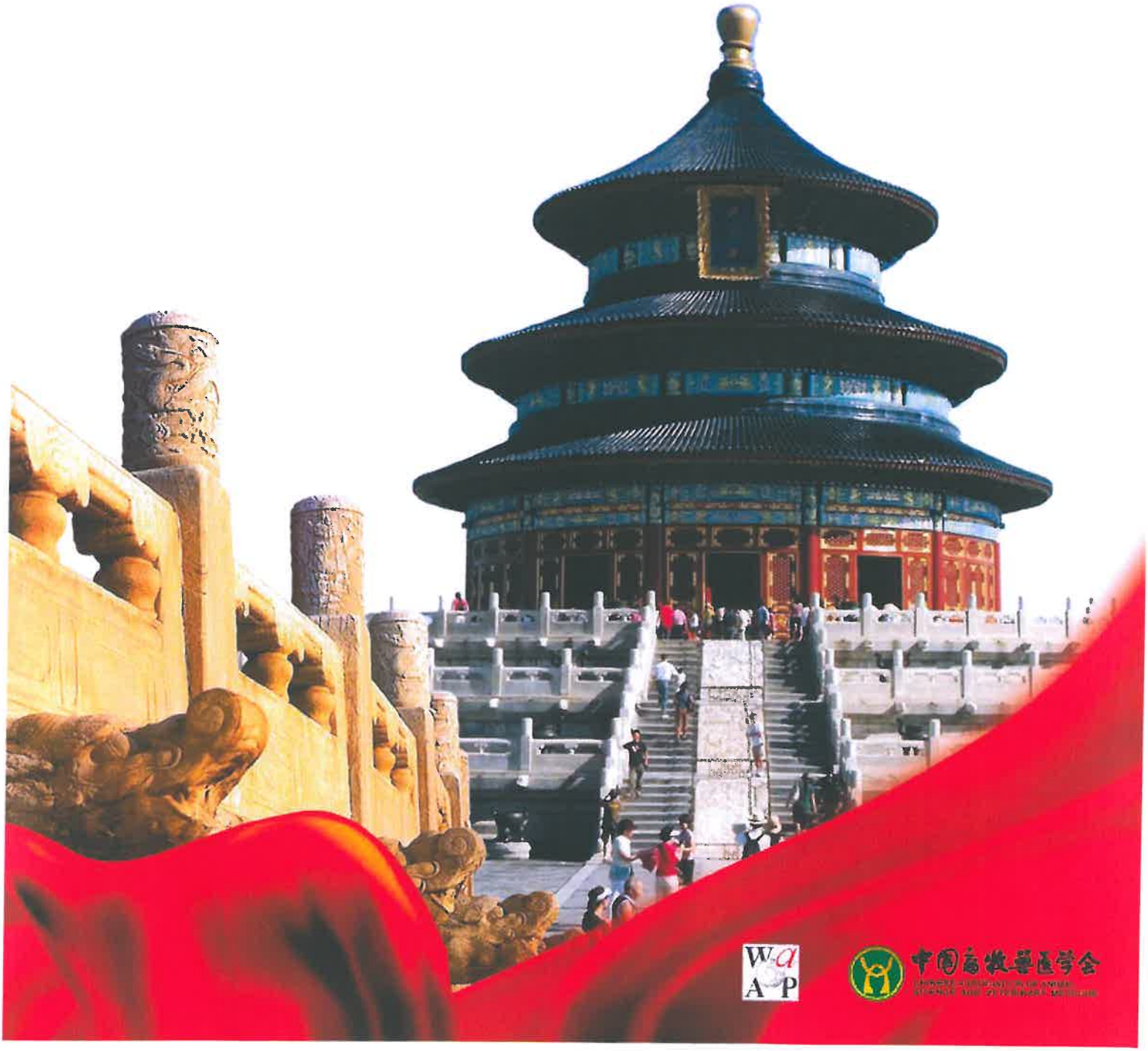
11th World Conference on Animal Production

WCAP 2013

PROCEEDINGS



indicated that the presence of a residue with high hydrophobicity at position 23 of GI-24 was important for antimicrobial activity, but the natural Trp was not necessary. All the peptides displayed a much higher cell selectivity as compared to melittin, which was chosen as a control peptide. The preference of PMAP-36 and GI-24 for binding to negatively charged phospholipids (mimicking bacterial membranes) over zwitterionic phospholipids (mimicking mammalian membranes) correlated with their high bactericidal activity and low cytotoxicity. In addition, both PMAP-36 and GI-24 showed strong resistance to NaCl, $MgCl_2$, and $CaCl_2$. In order to elucidate the antimicrobial mechanism, the membrane permeabilization, flow cytometry-based membrane integrity assay, and scanning electron microscopy (SEM) were performed. The results demonstrate that PMAP-36, GI-24, and GI-24-W23L had greater potential to damage the bacterial cell membrane than melittin. However, the capacity to disrupt bacterial cell membrane of GI-24-W23K or GI-24-W23A was significantly reduced after the substitution of Trp with Lys or Ala, suggesting that a residue with high hydrophobicity at position 23 of GI-24 played an important role in peptide-membrane interaction. Furthermore, to investigate the possibility of the intracellular targets of the peptides, DNA binding assays was performed. PMAP-36 and its analogs displayed the similar DNA binding activity, suggesting that the difference in the antimicrobial activity of the peptides due to the different membrane penetration activity, and the exact nature of residue 23 of GI-24 is less important as long as it is a hydrophobic residue. All the findings supported that truncation and residue substitution are effective strategy for developing novel antimicrobial peptides with less cost. But in this process, there are some important position and residue need to been noticed. Additionally, GI-24 could be developed as a promising antibiotic candidate with low price.

Keywords: Antimicrobial peptides; PMAP-36; Single site-substitution; Residues; Bactericidal mechanism

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The chemistry and biochemical functions of *Plantain* (*Plantago lanceolata* L.): A natural growth promoter for livestock.

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The plantain (PL, *Plantago lanceolata* L.) is one of the perennial herbs which have been used as a folk medicine in the treatment of a number of diseases over centuries. Moreover, plantain also used as animal pastures in different parts of the world. The plant breeders have developed two cultivars, and we compared these cultivars with 25 ecotypes of plantain found in northern Japan. It contains different bioactive components, acteoside, aucubin, catalpol, caffeic acid derivatives, terpinoids, alkaloids and considerable amount of crude protein. Plantain also possesses considerable superoxide anion radical scavenging activities. It was hypothesised that feeding P. lanceolata to animals improves their physiological condition and has great potential for the production of safe, health-promoting and high-quality products. Therefore, we have been performing numerous experiments on the genetic and environmental variations in contents of the above mentioned compounds, and on the effects of feeding P. lanceolata on the composition of both animal health and its products. In this paper the major findings have been summarized and evaluated the usefulness of this plant species in animal production. Furthermore, we discuss the potential specific effects of cultivars differing in the types and amounts of bioactive compounds. Plantain enhanced tissue responsiveness to insulin in sheep without changing tissue sensitivity which was measured by the hyperinsulinaemic euglycaemic clamp procedure, and lowered the plasma non-esterified fatty acid contents. Plantain decreased abdominal fat accumulation, lipids and triglyceride contents of liver, thiobabituric acid values of meat and the amount of hexanol generated from the liver during storing and increased the contents of essential fatty acids and docosahexaenoic acid in chickens. Plantain also played positive impact on whole body protein synthesis, plasma glucose metabolism in sheep. The plantain was found resistant to thermal stress and hormone, insulin. In addition, plantain decreased lipids contents and increased the meat grade of pork.
The above mentioned properties attribute to the use of plantain for the improvement of the performance and health of livestock, and also could be considered for improving human health, including metabolic syndrome. Various studies about the biomedical composition of plantago species has been carried out throughout the world. The use of herbal plant, plantain, would ensure the future generation with bioactive compounds through pharmacological process in therapeutic challenges. The thirst of seeking natural herbs containing bioactive components for the livestock production would get assurance from this herb. This herb could be used for the safe production of meat, milk and eggs to ensure healthy generation in the 21st century.

Keywords: Plantain; Bioactive components; Sheep; Chicken; Free radicals; Plasma metabolites

WCAP2013-2-02-018

***Arthrospira platensis*: A novel feed supplement improves the meat eating quality of Australian lamb.**

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Feeds and feeding account for a substantial cost of sheep production, hence the quest for alternative sources of nutrients that can facilitate fast growth in prime lambs without comprising meat eating quality is a continuous research endeavour. This study examined the effect of daily oral drenching of grazing prime lambs with a highly nutritious and edible blue-green microalga commonly referred to as Spirulina (*Arthrospira platensis*) for nine weeks on meat eating quality and consumer acceptability. The prime lambs were weaners from Merino ewes sired by Dorset, White Suffolk, Black Suffolk and Merino rams randomly allocated to 3 levels of Spirulina supplementation (0, 10 and 20% wt/vol) with 8 lambs per treatment. The lambs were balanced by gender (ewes and wethers), body condition score (average of 3.1 ± 0.4) and body weight (average of 37.6 ± 5.2 kg). Lambs were slaughtered in a commercial abattoir and Longissimus dorsi muscle samples barbequed. A consumer tasting panel subjectively evaluated the sensory meat eating qualities of tenderness, juiciness, aroma, appearance and overall liking. The data were subjected to statistical analyses utilizing the GLM procedures in SAS with sire breed, sex, Spirulina level and their second-order interactions fitted as fixed effects and sire as a random variable. The consumer panel detected highly significant

($p<0.001$) differences in meat tenderness with the high supplementation group being the least tender (6.8 ± 0.2) compared with the low (7.6 ± 0.2) and control (8.0 ± 0.2) treatments out of a maximum possible score of 10. These results indicated that Spirulina supplementation at a 10% inclusion level produced leaner, healthier meats with relatively little impact on overall eating quality when compared with meat from animals at either 0% or 20% supplementation levels. This will enable prime lamb producers to make informed decisions regarding the most economically viable use of Spirulina in their flock in targeting potential new niche markets. The study also supports the hypothesis that Spirulina lowers intramuscular fat levels and improves meat tenderness at low levels of supplementation without detrimental effects on eating quality.

Keywords: Spirulina; Meat quality; Prime lamb; *Arthrospira platensis*

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Energy requirements for maintenance and growth of early-weaned Dorper crossbred lambs.

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In recent years, the Dorper sheep was imported into China and used to improve performance and carcass traits of the indigenous breeds. Thin-tailed Han sheep is a famous Chinese indigenous sheep breed and is widely used in China for its precociousness and prolificacy. The Dorper × Thin-Tailed Han cross has become one of the most important sheep breeds in China. Nonetheless, energy requirements of this breed have not been defined thoroughly. The objective of this study was to determine the energy requirements for maintenance and growth of 1/2 Dorper × 1/2 Thin-Tailed Han crossbred non-castrated female lambs. Thirty-five Dorper × Thin-tailed Han crossbred, intact female lambs weaned at approximately 50 d of age (20.34 ± 2.15 kg of BW), were used. Seven randomly selected lambs were slaughtered at the start of the trial (baseline group). An intermediate group consisting of 7 randomly selected lambs, fed for ad libitum intake, that were slaughtered when they reached an average BW of 28.3 ± 1.64 kg. The remaining 21 lambs were allocated randomly on d 0 to 3 levels of DMI (treatments were ad libitum or restricted to 70 or 40% of the ad libitum intake) within 7 slaughter groups. A slaughter group contained 1 lamb from each treatment, and lambs were slaughtered when the ad libitum treatment lamb reached 35 kg BW. Individual body components (muscle, bone, fat, blood plus internal organs and hide) were weighed, ground, mixed, and sub-sampled for chemical analyses. Total body energy, N, fat, ash, and moisture contents were determined. In a digestibility trial, 15 Dorper × thin-tailed Han crossbred intact female lambs (28.70 ± 21.34 kg of BW) were housed in metabolism cages and used in a completely randomized design experiment to evaluate the energetic value of the diet at different feed intake levels. The results showed that the maintenance requirements for NE and ME were 247.74 and 386.65 $kJ \cdot kg^{-1}$ metabolic shrunk BW (SBW0.75), respectively. Consequently, partial efficiency of energy use for maintenance was 0.64. Net energy requirements for growth ranged from 1.18 to 5.18 $MJ \cdot d^{-1}$, for the lambs gaining 100 to 350 $g \cdot d^{-1}$ from 20 to 35 kg body weight. Partial efficiency of ME for growth was 0.442. Dorper × Thin-tailed Han crossbred lambs showed lower energy requirements to those reported by most nutritional systems.

Keywords: Mutton sheep; Comparative slaughter; Energetic efficiency; Maintenance; Growth

WCAP2013-2-02-005

Legume tree foliages (*Leucaena leucocephala* & *Gliricidia sepium*) as additives to improve the nutritive value of grass silages (*Pennisetum purpureum* cv. King Grass).

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Lack of good quality and sufficient pastures to feed their ruminant herds during the dry season is the most common problem faced by farmers in humid and semi-humid tropics. This is mainly solved by making grass hay or silages, where conservation practices are utilized. However, using diets based on preserved grasses creates the need for feeding energy and/or protein rich supplements because of the well-known nutritional limitations of tropical grasses. These are expensive options for the vast majority of farmers compared with feeding legume fodders which have a better nutritive value. Thus, this research aims to evaluate the effects of adding increased proportions of two legume tree foliages (*Leucaena leucocephala*, LL and *Gliricidia sepium*, GS) on the fermentation patterns and nutritive value of mixed silages with King Grass (*Pennisetum purpureum* cv. King Grass, PP), to promote their use as cheap and sustainable feeding alternatives. The experiment was carried out by evaluating mixtures of 67% fresh PP forage with 33% of LL (LL+PP) or GS (GS+PP) edible foliages, and PP alone (PP). The chemical composition and ensiling potential (buffering capacity, soluble carbohydrates) of forages were quantified before ensiling. After 70 days of conservation, silages were nutritionally evaluated in an "*in vivo*" digestibility and nitrogen retention trial using castrated lambs. Firstly, it was proved that the two types of plants (legumes vs. grass) are considerably different in terms of chemical composition and ensiling potential due to higher percentages of crude protein (23.48 & 21.93 vs. 7.14), lower soluble carbohydrates concentration (4.5 & 5.0 vs. 11.5%) and higher buffering capacity (41.5 & 46.0 vs. 23.5 g/kg DM), for LL & GS vs. PP, respectively. Such differences, and some others like those ones in the mixed silages, suggest considering legumes as nutritional supplements when legumes are mixed with grasses. The higher intakes of dry matter (67.87 & 69.68 vs. 47.32 g/kg PV0.75) and other nutrients, better digestibility percentages (Example: 60.63 & 60.23 vs. 56.41, for the organic matter) as well as increased nitrogen retention and metabolizable energy (9.08 & 8.83 vs. 8.30 MJ/ kg MS) in the mixed silages (LL+PP & GS+PP vs. PP, in that order) allowed the conclusion that the nutritive value of tropical silages can be improved by mixing the above cited legumes and grasses before ensiling. This recommended option could grant feeding levels above maintenance requirements for lambs and other ruminants.

Keywords: Leucaena; Foliage; Additive; Grass; Silage

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Endogenous amino acid excretion by normal and caecectomized cockerels as influenced by a protein free diet, mineral free diet and